

Programmable Power Supply

IPS-3201/3202

User Manual

RS Components Ltd

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SAFETY TERMS AND SYMBOLS

These terms may appear in this manual or on the product:

- 

WARNING. Warning statements identify condition or practices that could result in injury or loss of life.
- 

CAUTION. Caution statements identify conditions or practices that could result in damage to this product or other property.
- 

WARNING: This equipment is not for measurements performed for CAT II, III and IV.


Measurement category I is for measurements performed on circuits not directly connected to MAINS.


Measurement category II is for measurements performed on circuits directly connected to the low voltage installation.


Measurement category III is for measurements performed in the building installation.


Measurement category IV is for measurements performed at the source of the low-voltage installation.


The following symbols may appear in this manual or on the product:

- 

DANGER
High Voltage
- 

ATTENTION
refer to Manual
- 

Protective
Conductor
Terminal
- 

Earth (ground)
Terminal
- 

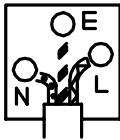
Frame or Chassis
Terminal

FOR UNITED KINGDOM ONLY


NOTE: This lead/appliance must only be wired by competent persons

WARNING: THIS APPLIANCE MUST BE EARTHED

IMPORTANT: The wires in this lead are colour-coded in accordance with the following code:

- 
- | | |
|----------------|--------------|
| Green/ Yellow: | Earth |
| Blue: | Neutral |
| Brown: | Live (Phase) |

As the colours of the wires in main leads may not correspond with the colour markings identified in your plug/appliance, proceed as follows:

The wire which is coloured Green & Yellow must be connected to the Earth terminal marked with the letter E or by the earth symbol  or coloured Green or Green & Yellow.

The wire which is coloured Blue must be connected to the terminal which is marked with the letter N or coloured Blue or Black.

The wire which is coloured Brown must be connected to the terminal marked with the letter L or P or coloured Brown or Red.

If in doubt, consult the instructions provided with the equipment or contact the supplier.

This cable/appliance should be protected by a suitably rated and approved HBC mains fuse: refer to the rating information on the equipment and/or user instructions for details. As a guide, cable of 0.75mm² should be protected by a 3A or 5A fuse. Larger conductors would normally require 13A types, depending on the connection method used.

Any moulded mains connector that requires removal or replacement must be destroyed by removal of any fuse & fuse carrier and disposed of immediately, as a plug with bared wires is hazardous if engaged in live socket. Any re-wiring must be carried out in accordance with the information detailed on this label and in accordance with local regulations. If further information is required, contact the supplier, the address is given at the end of these instructions.

1. PRODUCT INTRODUCTION

1-1. Description

The IPS series programmable power supplies are controlled by a Microprocessor Unit (MPU), which can be connected via an in-built RS-232 communication interface to a personal computer. This allows remote operation for automatic testing and control as may be required by the user.

The voltage and current are controlled by a 12 bit D/A converter with high resolution and accuracy. The digital control of the system allows simple and precise entry of information, together with clear and unambiguous monitoring of the instrument parameters.

The over-voltage protection (OVP) and over-current protection (OCP) is set through software and detected by hardware to provide continuous protection for the instrument, external circuits and the user.

1-2. Features

- 1) Digital control and programmable interface with high resolution and precision.
- 2) The 192×128 point LCD display can show multiple settings and measurement results simultaneously. The display format may be changed to suit individual requirements.
- 3) Intuitive interface window display allows convenient operation of the instrument.
- 4) High stability and low drift.
- 5) Over voltage, over current and over temperature protection.
- 6) Intelligent fan speed control
- 7) Warning signals via built-in buzzer.
- 8) 1/2 rack width for convenient rack installation.
- 9) Rotary knob for fine and coarse adjustment of settings.
- 10) 100 groups of memories for storing settings.
- 11) Parallel and series operation modes.
- 12) Programmable internal timer for output ramp-up, dwell & ramp-down operation.

2. TECHNICAL SPECIFICATIONS

SPECIFICATIONS		IPS-3201	IPS-3202
Output	Voltage	0-32V×3	0-32V×2, 0-6V×1
	Current	0-1A×3	0-2A×2, 0-5A×1
	OVP	0-33V×3	0-33V×2, 0-7V×1
Load effect	Voltage	3mV(5mV rating current>3.0A), test points are at the +output terminal and –output terminal point.	
	Current	3mA(5mA rating current>3.0A), test points are at the +output terminal and –output terminal point.	
Source effect	Voltage	3mV, test points are at the +output terminal and –output terminal point.	
	Current	3mA, test points are at the +output terminal and –output terminal point.	
Setting resolution	Voltage	10mV	
	Current	1mA(2mA rating current>3.0A)	
	OVP	10mV	
Program accuracy (25±5)	Voltage	0.05%+20mV	
	Current	0.1%+5mA(+10mA rating current>3.0A)	
	OVP	0.05%+20mV	
Ripple & noise (20Hz~20MHz)	Voltage	Ripple 1mVrms/3mVp-p Noise 2mVrms/30mVp-p	
	Current	3mA _{rms} (5mA _{rms} rating current>3.0A)	
Temperature coefficient (0~40)	Voltage	100ppm+3mV	
	Current	100ppm+3mA	
Readback resolution	Voltage	10mV	
	Current	1mA(2mA rating current >3.0A)	
Response time; Voltage up Voltage down	10%~90%	100ms	
	90%~10%	100ms (10% rating load)	

Readback temperature Coefficient	Voltage	100ppm+10mV
	Current	150ppm+10mA
Drift	Voltage	100ppm+10mV
	Current	150ppm+10mA
Tracking operation	Tracking error	0.1%+20mV
	Series (Load effect)	20mV
Parallel operation	Program accuracy	Voltage 0.05%+20mV Current 0.1%+10mA OVP 0.05%+20mV
	Load effect	Voltage 3mV(5mV rating current>3.0A) Current 6mA, test points are at the +output terminal and –output terminal point.
	Source effect	Voltage 3mV,Current 6mA, test points are at the +output terminal and –output terminal point.
Memory		Store/Recall points 0~99
Timer	Setting time	0.1sec~99min59sec(max×100)
	Resolution	0.1sec
	Function	For output working loop (Auto-step running)
Interface	RS232, GPIB interface option	
Power source	100, 120, 220V±10%, 230V +10%/-6% 50/60Hz. AC	
Power consumption	IPS-3201: 210W IPS-3202: 360W	
Mechanical specifications	Dimensions	230(W)×140(H)×380(D) mm.
	Weights	10 kg

SPECIFICATIONS	IPS-3201	IPS-3202
Operating environment	Indoor use only Altitude: up to 2000 metres Ambient temperature: To satisfy specifications: 10 to 35 (50° F to 95° F) Maximum operating range: 0 to 40 (32° F to 104° F) Relative humidity: 85% RH(max.), non condensing Installation Category: II Pollution degree: 2	
Storage temperature & humidity	-10° to 70 , 70%RH (maximum)	
Supplied accessories	Power cable..... × 1 Instruction manual.....× 1 Programming manual..... × 1 Test leads..... × 3	

3. OPERATING PRECAUTIONS

3-1. Unpacking the instrument

The product has been fully inspected and tested before shipment. On receiving the instrument, please unpack and inspect it for damage caused during transportation. If any sign of damage is found, notify the bearer and/or the supplier immediately.

3-2. Checking the supply voltage

The IPS power supplies can be connected to any supply voltages shown in the table below. Before connecting the power plug to an AC outlet, ensure the voltage selector on the rear panel is set to the correct position corresponding to the supply voltage (Refer to section 6-2). Damage may be caused to the instrument if connected to an incorrect supply voltage.



WARNING. To avoid electrical shock the power cord protective grounding conductor must be connected to ground.



WARNING. To avoid personal injury, disconnect the power cord before removing the fuse holder.

When line voltages are changed, replace the fuses as shown below:

Model	Line voltage	Input Range	Fuse	Line voltage	Input Range	Fuse
IPS-3201	100V	90-110V	T3A 250V	220V	198-242V	T1.6A 250V
IPS-3202	120V	108-132V	T5A 250V	230V	216-253V	T2.5A 250V

Note: Fuse type is 5 × 20mm HBC ceramic.

3-3. Operating environment

The operating ambient temperature range of this instrument is from 0° to 40°C (32° to 104°F). Do not operate the instrument outside this temperature range, otherwise damage may be caused to the instrument.

Do not use the instrument where strong magnetic or electric fields exist, as it may disturb the operation of the instrument.

Use the instrument in an area free from dust and direct exposure to sunlight.



WARNING. Do not use the instrument in wet areas or where water or other liquids may fall on or enter the instrument, as this may cause a shock hazard or damage the instrument.



WARNING. If this equipment is used in a manner not specified in these instructions, the protection afforded by the equipment may be impaired.

4. CONTROL PANEL

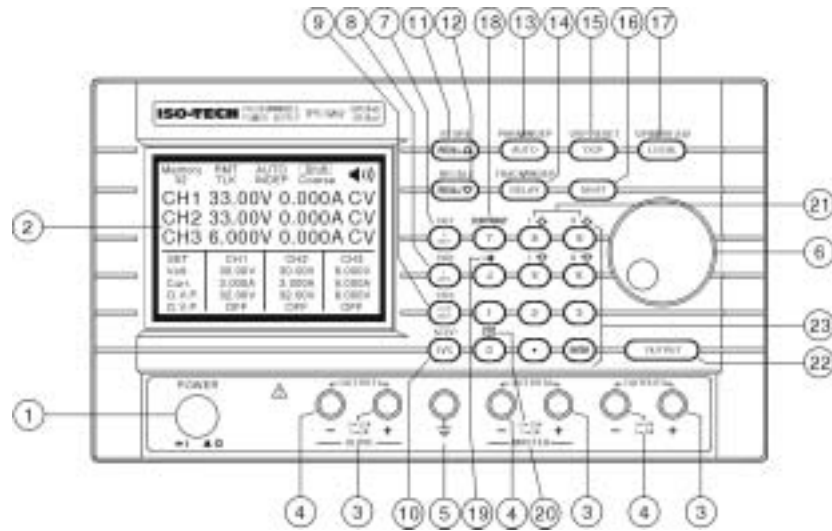


Figure 4-1 Front Panel

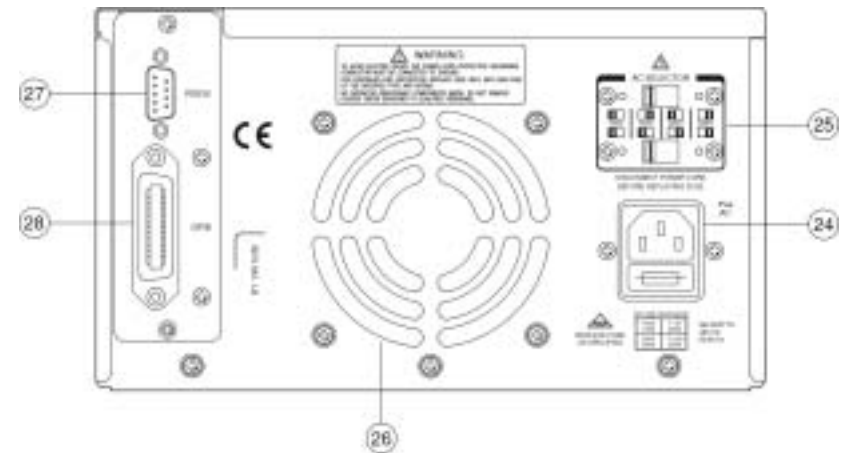




Figure 4-2 Rear Panel

1. Power switch Turns the AC power on to the instrument..
2. Display Indicates the setting of voltage and current values, output voltage and current value and the instrument and output status.
3. +Output terminal Positive output terminal.
4. -Output terminal Negative output terminal.
5. GND terminal Ground terminal connected to instrument chassis.
6. Rotary encoder Variable control knob.
7. V set (CH1) Output voltage setting.
Switch to channel 1 by pressing [SHIFT][CH1] to enable setting of group parameters.
8. I Set (CH2) Output current setting.
Switch to channel 2 by pressing [SHIFT][CH2] to enable setting of group parameters.
9. OVP Set (CH3) Over voltage protection value setting.
Switch to channel 3 by pressing [SHIFT][CH3] to enable setting of group parameters.
10. F/C (STEP) Allows coarse or fine adjustment selection for the rotary control knob. Press [SHIFT][STEP] to select.
11. Recall (Store) Recall the next set of stored information.
Press [SHIFT][STORE] to store and edit information.
12. Recall (Recall) Recall the previous set of stored information.
Recall the highlighted stored information or set the range of information to recall automatically by pressing [SHIFT][RECALL].
13. AUTO (PARA/INDEP) Turn on/off automatic operation function by setting the AUTO on or off.
Operate the instrument in parallel mode by pressing [SHIFT][PARA]. Return to independent mode by pressing the keys again.

14. Delay (TRACK/INDEPT) Set the voltage and current output delay time in automatic operation mode.
Operate the instrument in series mode by pressing [SHIFT][TRACK]. Return to independent mode by pressing the keys again.
15. OCP (OVP RESET) Turn the over current protection on or off.
Reset the over voltage protection mode by pressing [SHIFT][OVP RESET].
16. SHIFT Second function selection.
17. Local Clear the remote control mode from RS232 and enable front panel control.
18. Contrast Press [SHIFT][CONTRAST] to adjust the contrast of the display.
19.  Press [SHIFT][] to turn the buzzer on or off.
20. W Press [SHIFT][W] to change the character size.
21. I Press [SHIFT], then press I to increment one step of the output current.
I Press [SHIFT], then press I to decrement one step of output current.
V Press [SHIFT], then press V to increment one step of output voltage.
V Press [SHIFT], then press V to decrement one step of output voltage.
22. Output Turn on or off output by pressing the button.
23. 0~9, “ . ”, ENTER Value input.
24. AC power socket AC mains power input connector.
25. AC select switch Select mains supply voltage to 100V, 120V, 220V or 230V, 50/60Hz AC.
26. Cooling fan Internal cooling fan air outlet.
27. Interface connector RS-232C serial communication interface connector .

5. OPERATION

5-1. Output voltage and current setting

Press [SHIFT][CHx] to select the required output channel. The cursor will be set to CHx (x=1, 2 or 3). Refer to the drawing below:

Model	20	INDEF	Flaw
CH1	33.00V	0.000A	CV
CH2	33.00V	0.000A	CV
CH3	6.000V	0.000A	CV
SET	0.000	CH2	CH3
Vol	0.000	0.000	0.000
Cur	0.000	0.000	0.000
Vol	0.000	0.000	0.000
Cur	0.000	0.000	0.000

--Output voltage setting:

Method 1: Press [V SET] and use the numeric keypad to enter the voltage value then press [ENTER].

Method 2: Press [V SET] and use the rotary knob to select the required voltage value and the output voltage setting will be changed. Press [ENTER] to terminate the voltage setting. Using this method, the output voltage will change immediately following the input value through the rotary knob.

Example: Set voltage at 32.00V.

Press [V SET][3][2][.][0][0][ENTER]

--Output current setting:

Method 1: Set output current by pressing [I SET] and using numeric keypad to enter the required current value and press [ENTER].

Method 2: Press [I SET] and use the rotary knob to select the required current value and the output current setting will be changed. Press [ENTER] to terminate the current setting. Using this method, the output current will be changed immediately following the input value through the rotary knob.

Example: Set current at 1.000A.

Press [I SET][1][.][0][0][0][ENTER]

When the load current through output terminal exceeds the setting value, the instrument then operates in constant current mode. If the load current remains below the set value, the instrument operates in constant voltage mode.

5-2. Over voltage and over current protection setting

Press [SHIFT][CHx] to select the required output channel. The cursor is set to CHx (x=1, 2 or 3).

--Over voltage protection setting:

Method 1: Set OVP voltage level by pressing [OVP SET] and use numeric keypad to enter the required voltage value, then press [ENTER].

Method 2: Press [OVP SET], use the rotary knob to select the required voltage value and the OVP voltage setting will be changed. Press [ENTER] to terminate the OVP voltage setting. Using this method, the OVP setting will change immediately following the input value through the rotary knob.

Example: Set OVP voltage at 33.00V.

Press [OVP SET][3][3][.][0][0][ENTER]

--OVP status clear:

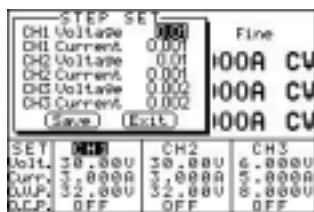
When the output voltage exceeds the set 33.00V OVP value, the output will turn off. The instrument will enter OVP mode and the display will show “Over voltage protection”. Press [SHIFT][OVP RESET] to clear the OVP state and return to normal operation.

--Over current protection setting:

The OCP of each channel may be set individually by pressing [OCP]. If OCP is on, when the output current for the channel equals or exceeds the set current value, the output of the instrument will turn off. The instrument will enter OCP mode and the display will show “Over current protection”. Press [OCP] to clear the OCP state and return to normal operation.

5-3. Voltage and current step setting:

Press [SHIFT][STEP] to enter into the item selection menu. Use the rotary knob to set the cursor to the item which is to be modified. Use the keypad to enter the required value and press [ENTER]. Store the setting by using the knob to move the cursor to [SAVE], then press [ENTER] again to complete the setting and storing. To cancel the setting, move the cursor to [EXIT] and press [ENTER] to terminate the setting without storing.



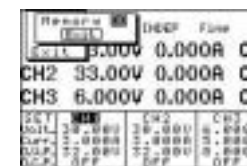
Example : Set the step voltage of Channel 1 at 1.00V and the step current at 0.10A.

Press [SHIFT][STEP], select CH1 voltage and enter [1][.][0][0][ENTER]. Select CH1 Current and enter [0][.][1][0][0][ENTER]. Finally, use the knob to move the cursor to [SAVE] and press [ENTER] to complete the setting and storing.

Note: The setting of the step voltage and step current of CH1 CH2 CH3 can be set using the same display window.

5-4. Information storing and recalling:**--Information storing:**

Press [SHIFT][STORE] to enter item selection menu. Use the rotary knob to set the cursor to [STORE] and press [ENTER]. The memory store menu will appear. Use the numeric keypad to enter the store address and press [ENTER] to complete the store.

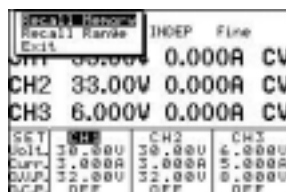


Example : The current setting store address of the instrument is “00”.

Press [SHIFT][STORE] to enter the item selection menu. Use the rotary knob to set the cursor to [STORE], then press [ENTER] and input [0][0][ENTER] to complete the store.

--Information recall:

Press [SHIFT][RECALL] to enter the item selection menu. Use the rotary knob to set the cursor to [Recall Memory] and press [ENTER] to display the memory recall menu. Enter the recall address by using the numeric keypad and press [ENTER] to complete the recall.



Example: Recall the store address “00” to the current status of the instrument.

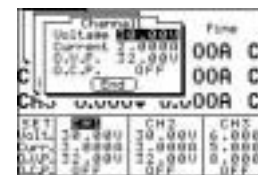
Press [SHIFT][RECALL] to enter the item selection menu and use the knob to set the cursor to recall memory.

Press [ENTER] and input [0][0][ENTER] to complete the recall setting.

5-5. Information editing and copying:

--Information Editing (Edit):

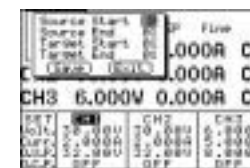
Press [SHIFT][STORE] to enter the item selection menu and use the rotary knob to set the cursor to [Edit]. Press [ENTER] to display the memory editing menu, enter the address to edit using the numeric keypad and press [ENTER] to display the edit selection menu. Use the rotary knob to set the cursor to the item to edit, enter the new value or on/off status by using the number keys and press [ENTER] to confirm the change. After the modification is completed, set the cursor to [End] using the rotary knob and press [ENTER] to complete the setting. If required, continue with other setting changes by returning to the previous menu and repeating above procedures. When modification is complete, use the knob to set the cursor to [SAVE] and press [ENTER] to complete the edit session. To cancel changes, set the cursor to [Exit] and press [ENTER] to terminate the session without storing the changes.



--Information copying:

Press [SHIFT][STORE] to enter item selection menu, select copy and press [ENTER] to enter the copy setting menu. Select the modified item, enter copy address and press [ENTER]. After modification, select [Save] and press [ENTER] to complete the setting. To cancel changes, set the cursor to [Exit] and press [ENTER] to terminate the setting without storing.

Note: Do not repeat the address of source and target input. The value of the end setting must be larger than of the start setting.



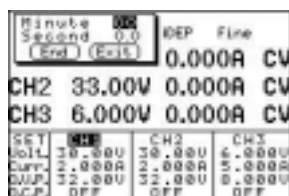
5-6. Auto-operation.

--Delay time setting:

Press [DELAY] to enter item selection menu and use the rotary knob to set cursor to the required setting item. Enter the required time using the numeric keypad and press [ENTER]. Finally use the rotary knob to set the cursor to [End] and press [ENTER] to complete the setting. The delay time setting must also be stored in the specific location of the memory address according to the procedure of 5-4 “Information storing”. Note; when the store procedure is in operation, all the other settings of the instrument

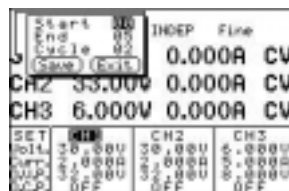
will be also stored in the same memory address.

To cancel changes, set the cursor to [Exit] by using the rotary knob and press [ENTER] to terminate the setting without storing.



--Auto-operation

Press [SHIFT][RECALL] to enter item selection menu, use the rotary knob to set the cursor to recall range and press [ENTER] to display the auto operation menu. Set the cursor to the item to be modified by using the rotary knob. Use the numeric keypad to input the auto operation setting value and press [ENTER]. After modification, use the knob to set the cursor to [Save], and press [ENTER] to complete the setting. To cancel the changes, set the cursor to [Exit] by using the rotary knob and press [ENTER] to terminate the setting without storing.



Note: When the auto operation value is set to "00", the operation will continually cycle until cancelled.

5-7. Parallel operation mode

Press [SHIFT][PARA] to enter the parallel operation mode. In this mode, the output voltage and current are controlled by channel 2. The selectable range of output voltage is the same as channel 2 under normal independent operation, but the settable range of output current is twice that of channel 2 under normal independent operation.

Example:

- (1) Channel 1: Voltage=10V, Current= 1A.
- (2) Channel 2: Voltage=20V, Current= 2A.
- (3) Press [SHIFT][PARA] to enter parallel mode.
- (4) Output voltage=20V, output current=4A.

5-8. Tracking operation mode

Press [SHIFT][TRACK] to enter tracking operation mode. In this mode, output voltage and current are controlled by channel 2. The selectable range of output voltage is same as channel 2 under normal independent operation, but the output currents can have different values.

Example :

- (1) Channel 1: Voltage=10V, Current= 2A.
- (2) Channel 2: Voltage=20V, Current= 2A.
- (3) Press [SHIFT][TRACK] to enter tracking mode.
- (4) Output voltage=40V, output current=2A



WARNING. A voltage of more than 60V DC presents a lethal shock hazard. Take extreme care when connecting power supplies in series to achieve voltages greater than 60VDC total, or 60VDC between any connection and earth ground.

5-9. RS-232 Interface parameter setting

Press [SHIFT][RS-232] to enter item selection menu. Use the rotary knob to set the cursor to interface and press [ENTER] to display the interface selection menu. Set the cursor to the item to be modified by using the rotary knob and press [ENTER]. Set the cursor to address or Baud Rate setting as required. To modify the address, use the numeric keypad to enter the address value and press [ENTER]. To modify the Baud Rate, first press [ENTER], then use the rotary knob to set the cursor to the setting value to be modified and press [ENTER]. Finally set the cursor to [Save] by using the rotary knob and press [ENTER] to complete changes. To cancel the changes, set the cursor to [Exit] by using the rotary knob and press [ENTER] to terminate the setting without storing.

Interface	30	Baud Rate	9600
CH2	33.00V	0.000A	CV
CH3	6.000V	0.000A	CV
SET	Set	Baud	CH2
CH3	Exit	Save	

Example:

Set the RS-232 Baud Rate to 9600.

Press [SHIFT][RS-232] to enter item selection menu. Use the rotary knob to set the cursor to interface and press [ENTER] to display the interface selection menu. Set the cursor to RS-232 by using the rotary knob and press [ENTER]. Use the knob to set the cursor to [Baud Rate] and press [ENTER]. Set the cursor to [9600] and press [ENTER]. Finally set the cursor to [Save] and press [ENTER] to complete the setting and storing.

5-10. Maximum output setting values

MODEL ITEM	IPS-3201			IPS-3202		
	CH1	CH2	CH3	CH1	CH2	CH3
Output voltage	33V	33V	33V	33V	33V	7V
Output current	1.1A	1.1A	1.1A	2.1A	2.1A	5.2A
Over-voltage	34V	34V	34V	34V	34V	8V
Step voltage	10V	10V	10V	10V	10V	1V
Step current	0.5A	0.5A	0.5A	1A	1A	2.5A
Delay time	99'59"			99'59"		
Memory groups	100			100		

5-11. Test leads

Test leads supplied are suitable for the currents and channels as shown in the following table:

MODEL ITEM	IPS-3201			IPS-3202		
	CH1	CH2	CH3	CH1	CH2	CH3
	(3A) Test Lead	(3A) Test Lead	(3A) Test Lead	(3A) Test Lead	(3A) Test Lead	(4A-10A) Test Lead

Note: When using IPS-3202 in parallel output mode, use the 4A-10A test lead.

5-12. Remote control via the RS-232 interface

The IPS-series programmable power supplies can be remotely controlled via the RS-232 interface. Refer to the IPS-series Programming Manual for details of command strings and control options available.

6. MAINTENANCE

6-1. Fuse replacement



WARNING. *Disconnect power cord before replacing fuse. For continued fire protection, replace the fuse only with the specified type and rating.*

If the fuse blows, the display will not light and the power supply will not operate. During normal use, the fuse will not fail unless a fault has developed in the instrument. Replace the fuse only with one of the correct rating and type (refer to 3-2). The fuse is located on the rear panel (see Fig.4-2).

6-2. Line voltage adjustment

The primary winding of the power transformer is tapped to permit operation from 100, 120, 220, or 230VAC, 50/60 Hz supply voltage. Conversion from one line voltage to another is achieved by changing the AC voltage selectors on the rear panel.

The rear panel identifies the line voltage to which the unit was factory set. To convert to a different line voltage, proceed as follows:

- (1) Ensure the AC power cord is unplugged.
- (2) Use a small flat-blade screwdriver to change the AC selector switches to the desired supply voltage position.
- (3) A change in line voltage may also require a corresponding change of fuse value. Fit the correct fuse rating as indicated on the rear panel.
- (4) Connect the AC power cord, turn the instrument on and check for correct operation.

6-3. Cleaning

To clean the power supply, use a soft cloth dampened in a solution of mild detergent and water. Do not spray cleaner directly onto the instrument, since it may leak into the cabinet and cause damage. Do not use chemicals containing benzine, benzene, toluene, xylene, acetone, or similar solvents. Do not use abrasive cleaners on any portion of the instrument.

6-4. Repair and calibration

Servicing and repairs should only be undertaken by competent persons using correct components, equipment and procedures.

To maintain accuracy, the instrument should be calibrated yearly.

Contact the supplier or RS Components for details of repairs and calibration services. The address is given at the end of these instructions.

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